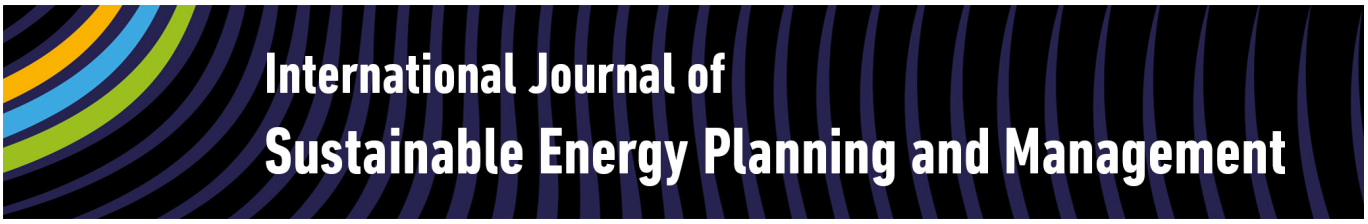
International Journal of Sustainable Energy Planning and Management Vol. 26 2020 01–04



Policies for new energy challenges

Paula Ferreira[a*], Isabel Soares[b], Rasmus Magni Johannsen[c], Poul Alberg Østergaard[c]

[a] *ALGORITMI Research Center University of Minho, Campus Azurém, 4800-058 Guimarães, Portugal*
[b] *Faculty of Economics, University of Porto and CEF.UP — Economics and Finance Research Center, University of Porto, Rua Dr Roberto Frias, 4200 - 464 Porto, Portugal*
[c] *Department of Planning, Aalborg University, Rendsburggade 14, 9000 Aalborg, Denmark*

ABSTRACT

This special issue presents some of the latest energy planning-related research as presented at the 2019 International Conference on Energy & Environment (ICEE), University of Minho, Portugal, 2019. In this issue, work is presented which investigates policy initiatives' effects on electricity prices. Other authors apply *Modern Portfolio Theory* to analyse the energy and environmental policies of the European Union member states. Solar thermal systems are analysed based on a novel costing methodology and lastly carbon dioxide emissions from a Portuguese energy system with further deployment of electric vehicles are assessed.

Keywords:

Energy policies;
Renewable energy sources;
Solar thermal;
Electric vehicles;

URL: http://doi.org/10.5278/ijsepm.3552

1. International Conference on Energy & Environment

The 2019 *International Conference on Energy & Environment* (ICEE) organized by the ALGORITMI Research Centre, University of Minho and FEP – School of Economics and Management, University of Porto (FEP), and the Economics and Finance Research Centre, University of Porto (CEF.UP), took place at University of Minho, Portugal on the 16th and 17th of May 2019.

This was the fourth edition of the ICEE conference and this special issue follows two previous special issues also dedicated to selected and extended versions of papers presented at the 2017 and 2013 conferences. These conferences and the ensuing special issues covered topics related to sustainable energy systems from the perspectives of various disciplines. The sustainable development challenges call for a multidisciplinary approach to energy decision making and require an effective bridge-building between political, technical, economic and social aspects as reflected in these past special issues.

The 2018 special issue [1] presented work from the 2017 ICEE, addressing energy markets, financing, and accounting and aimed to extend knowledge in the frontier of energy economics and engineering. The case of new financing models for renewable energy projects and its relation to business and credit risk was debated by de Broeck [2], along with the new accounting requirements to foster low-carbon capital spending in Europe and account for the environmental risks [3] and the need to redesign the electricity market to ensure that renewable energy benefits are effectivity transmitted to end-users [4]. The special issue thus had a focus on financial aspects and underlined the need to expand financing, accounting, and market mechanisms, to properly deal with the increasing investments on clean energy technologies as critical issues for the development of a sustainable economy.

The 2014 special issue [5] presented work from the 2013 ICEE, introducing energy research conducted on Portugal and Brazil, and debated relevant issues for these countries. Three papers addressed electricity

*Corresponding author - e-mail address: paulaf@dps.uminho.pt

demand, as was the case for Silva et al. [6] focusing on low-income families in Brazil, Gonçalves & Domingos [7] dealing with energy use in Portuguese cities and Brito & Sousa [8] addressing the world electricity demand. Two papers treated the feasibility of electricity production technologies including cogeneration of heat and power in buildings [9] and small-scale hydro plants [10]. Finally, one paper analysed the socio-economic impacts of energy efficiency programmes [11]. This special issue brought to the discussion different aspects of the electricity value chain and called attention to the need for proper consideration of not only technical aspects of electricity production technologies but also consumer and demand perspectives along with socio-economic impacts; in particular job creation.

Following this multidisciplinary approach that characterizes the ICEE conferences, this special issue aims to contribute to the debate on policies for some of the identified energy challenges. European energy and environmental policies are addressed under two perspectives, namely the impacts of these policies on household electricity prices [12] and their efficiency on different European member states [13]. The highly relevant issue of clean mobility is considered for the case of electric vehicle integration and its environmental impacts [14]. Ferreira & Silva [15] debate the financial and technical aspects of the solar thermal systems for residential buildings.

The series of special issues and ICEE conferences include already several papers that although coping with different topics, are contributing to the European strategic vision to reduce greenhouse gas emissions and for the main strategic building blocks outlined in the European Union [16]. Moreover, by bringing to the debate different disciplines and authors with different backgrounds we expect to create synergies and merge social, economic, environmental and technical knowledge to support policies towards a sustainable energy transition.

2. European energy policies

In this special issue, García-Álvarez et al. [12] focus on the analysis of both supply-side and demand-side policies in the European Union and its impacts on household electricity prices. The results suggest that measures on the demand side, namely energy taxes, may not be a suitable measure for lowering household electricity prices. On the other hand, evidence is found that renewable electricity support policies along with the liberalisation process seem to have resulted in higher household electricity prices. The authors conclude on the need to review both renewable energy support policy and the liberalisation model for achieving the goals of energy policy and ensure affordable household electricity prices.

Martínez Fernández et al. [13], present an assessment of the efficiency of energy and environmental policies of each European Union member state using the Modern Portfolio Theory (MPT). The results show an optimistic evolution with all countries moving towards cost *vs* risk efficiency of the power assets, although with some countries showing higher consistency in the design and implementation of policies. The paper applies a traditionally financial perspective (MPT) for the design of real power generation assets portfolios and energy policy analysis, demonstrating the benefits of an approach merging finance, technology, and policymaking.

2. Renewable energy for residential buildings

Ferreira & Silva [15] propose a costing methodology able to estimate the capital cost of solar-thermal systems according to the system size and energy requirements of a specific residential building. The methodology is subsequently applied for a reference case in Portugal and the paper concludes by investigating the economic and environmental interest of the technology for the residential sector, in particular when compared to electricity solutions for domestic hot water supply. The paper also opens routes for further research referring in particular to the need for the inclusion of thermal storage solutions in such analyses.

3. Clean mobility

Carvalho et al. [14] analyse the electric vehicle (EV) CO_2 emissions resulting from the EV integration in the Portuguese power system. The research put in evidence on the importance of developing a renewable energy system to ensure that EV integration will have an effective reduction of CO_2 emissions. The authors conclude that the EV specific emissions could range from 57 g CO_2/km, for high wind capacity and low EV penetration, to 129 g CO_2/km, for low wind capacity and low EV penetration. These results demonstrate the risk of making

aprioristic assumptions about the better performance of EVs over internal combustion vehicles. Moreover, the study confirms the pertinence of scenario analysis to examine the range of possible energy futures, in this case combining both power and transportation pathways.

References

[1] Soares I, Ferreira P, Østergaard PA. Energy markets, financing and accounting — special issue from 2017 International conference on energy & environment. Int J Sustain Energy Plan Manag 2018;15. http://dx.doi.org/10.5278/ijsepm.2018.15.1

[2] De Broeck W. Crowdfunding platforms for renewable energy investments: an overview of best practices in the EU. Int J Sustain Energy Plan Manag 2018;15. http://dx.doi.org/10.5278/ijsepm.2018.15.2.

[3] Rigot S, Demaria S. Potential Impediments to Long-Term and Low-Carbon Investment: The International Accounting Standards at Stake. Int J Sustain Energy Plan Manag 2018;15. http://dx.doi.org/10.5278/ijsepm.2017.15.3.

[4] Figueiredo NC, da Silva PP. The price of wind power generation in Iberia and the merit-order effect. Int J Sustain Energy Plan Manag 2018;15. http://dx.doi.org/10.5278/ijsepm. 2018.15.4.

[5] Østergaard PA, Soares I, Ferreira P. Energy efficiency and renewable energy systems in Portugal and Brazil. Int J Sustain Energy Plan Manag 2014;2. http://dx.doi.org/10.5278/ijsepm. 2014.2.1.

[6] Silva AS, Luiz F, Mansur AC, Vieira AS, Schaefer A, Ghisi E. Knowing electricity end-uses to successfully promote energy efficiency in buildings: a case study in low-income houses in Southern Brazil. Int J Sustain Energy Plan Manag 2014; 4. http://dx.doi.org/10.5278/ijsepm.2014.2.2

[7] Goncalves A, Domingos T. Scaling laws and electricity consumption in cities: a sectoral view. Int J Sustain Energy Plan Manag 2014; 4. http://dx.doi.org/10.5278/ijsepm.2014.2.3

[8] Brito M, Sousa T. Development of a "Current Energy Mix Scenario" and a "Electricity as Main Energy Source Scenario" for electricity demand up to 2100. Int J Sustain Energy Plan Manag 2014; 4. http://dx.doi.org/10.5278/ijsepm.2014.2.6

[9] Ferreira AC, Nunes ML, Martins LB, Fatima Teixeira S. Technical-Economic Evaluation of a Cogeneration Unit Considering Carbon Emission Savings. Int J Sustain Energy Plan Manag 2014; 4. http://dx.doi.org/10.5278/ijsepm.2014.2.4

[10] Cunha J, Ferreira P. A Risk Analysis of Small-Hydro Power (SHP) Plants Investments. Int J Sustain Energy Plan Manag 2014; 4. http://dx.doi.org/10.5278/ijsepm.2014.2.5

[11] Oliveira C, Coelho D, da Silva PP. A prospective analysis of the employment impacts of energy efficiency retrofit investment in Portugal by 2020. Int J Sustain Energy Plan Manag 2014; 4. http://dx.doi.org/10.5278/ijsepm.2014.2.7

[12] García-Álvarez, MT, Cabeza-García, L, Soares, I. An assessment of supply-side and demand-side policies in EU-28 household electricty prices. Int J Sustain Energy Plan Manag 2020. http://dx.doi.org/10.5278/ijsepm.3417

[13] Martínez Fernández. P, de Llano Paz, F, Calvo-Silvosa, A, Soares, I. An evaluation of the energy and environmental policy efficiency of the European Union member states in the last 20 years from an MPT perspective. Int J Sustain Energy Plan Manag 2020. http://dx.doi.org/10.5278/ijsepm.3482

[14] Carvalho E, Sousa, J, Lagarto, H. Assessing electric vehicle CO_2 emissions in the Portuguese power system using a marginal generation approach. Int J Sustain Energy Plan Manag 2020. http://dx.doi.org/10.5278/ijsepm.3485

[15] Ferreira AC, Silva, A. Application of a Costing Methodology to Estimate Capital Costs of Solar Thermal Systems in Residential Portuguese Context. Int J Sustain Energy Plan Manag 2020. http://dx.doi.org/10.5278/ijsepm.3483

[16] European Commission. Going climate-neutral by 2050. European Union; 2019. http://dx.doi.org/10.2834/02074